Modern Roundabouts

Understanding Your Design Vehicle

Friday, September 26, 2014

10:30 AM-12:00 PM Session 5B

Dana LeClaire – Kimley-Horn and Associates, Inc.

George White – Kimley-Horn and Associates, Inc.

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The Design Challenge

- Speed Control, Especially Smaller Vehicles
- Accommodate Large Trucks
- Don’t Impact Response Time For Emergency Vehicles
- Safe Transitions For Bicycles
- Safe Crossings For Pedestrians
- ADA Considerations

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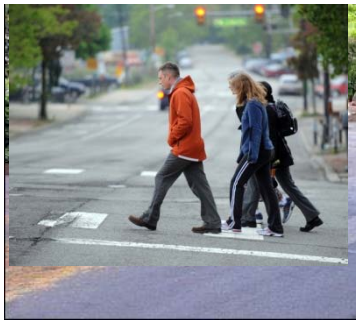
Multiple Design Vehicles



Can The Design Accommodate:

Passenger Vehicles and Large Vehicles, Emergency Vehicles, Pedestrians, Bicycles, Strollers, Wheelchairs, Groups etc…

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Passenger Vehicles

- Recent Car Advertisements Compare To Race Cars

- Importance Of Speed Control For Smaller Vehicles

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Emergency Vehicles

- Consult With Emergency Personnel
- Manufacturer Specifications
- May Need A Custom AutoTurn Template

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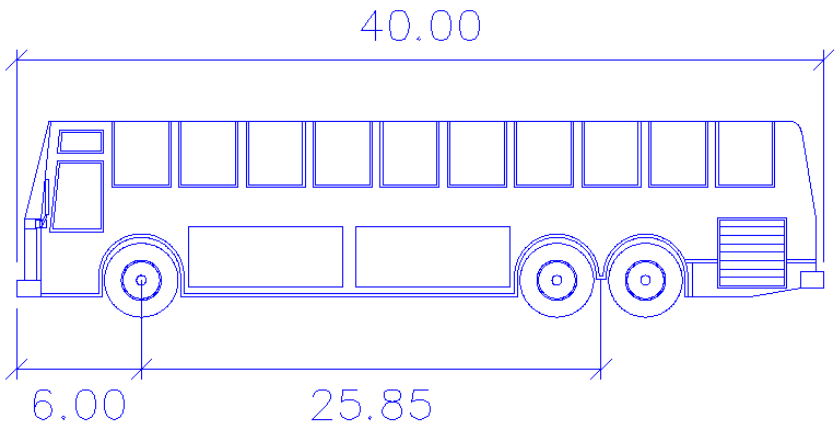
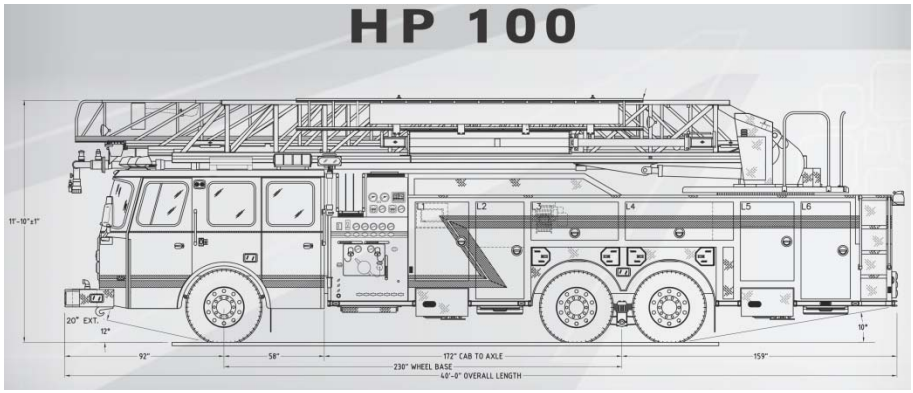
Emergency Vehicles





AutoTURN Bus-40
Wheelbase = 26’

E-One HP 100
Wheelbase = 19’

Both Vehicles Are 40’ Overall Length

Resource: http://www.e-one.com/ & AutoTURN

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Emergency Vehicles

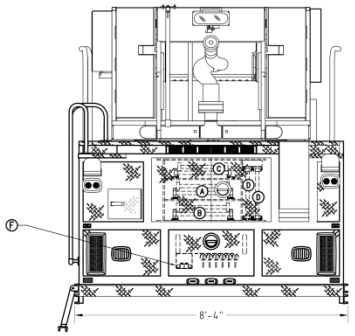
E-ONE

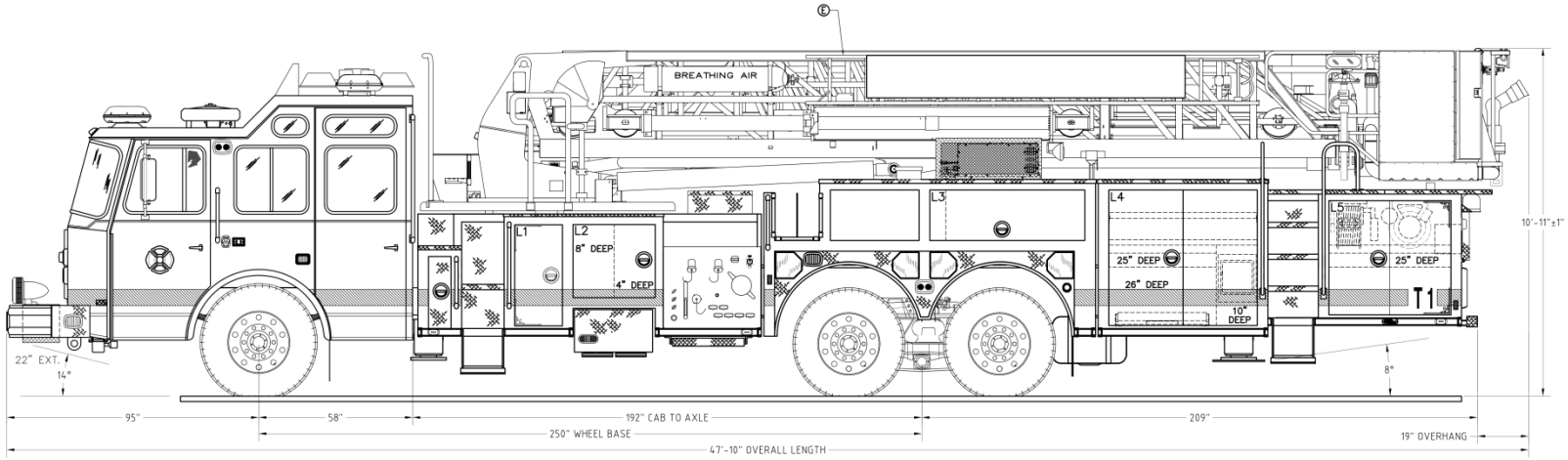
HP95 Mid Mount

SO.000000
L193 AERIAL BODY
H713 CYCLONE II CHASSIS
L397 AERIAL LADDER

270 GALLON WATER TANK 2000 G.P.M. HALE 8FGR PUMP ALL ALUMINUM CONSTRUCTION			HOSELOAD: 300' OF 5" HI VOL RBBR HOSE		
COMPT.	OPENING		INTERIOR DIMENSION		
L1	18W	38H	OIL RESEVOIR		
L2	31W	27H	31W	27H	NOTED
L3	58W	19H	58W	19H	25D
L4	56W	51H	56W 20H 25D UPPER 56W 27H NOTED LOWER		
L5	46W	43H	46W 16H 25D UPPER 46W 23H 26D LOWER		
R1	18W	38H	18W	38H	20D
R2	31W	27H	31W	27H	NOTED
R3	58W	19H	58W	19H	10D
R4	56W	51H	56W 19H 10D UPPER 56W 28H NOTED LOWER		
R5	19W	43H	19W 15H 10D UPPER 19W 18H NOTED LOWER		
R6	46W	43H	46W 15H 10D UPPER 46W 18H NOTED LOWER		

GROUND LADDERS				
ITEM	LADDER LENGTH	MODEL NUMBER	QTY	
A	35' 2-SECT.	PEL-35	1	
B	28' 2-SECT.	PEL-28	1	
C	24' 2-SECT.	PEL-24	1	
D	16' ROOF	PRL-16	2	
E	14' ROOF	PRL-14	1	ON AERIAL
F	10' FOLDING	FL-10	1	





48’ Overall Length
28’ Wheel Base

Resource: http://www.e-one.com/

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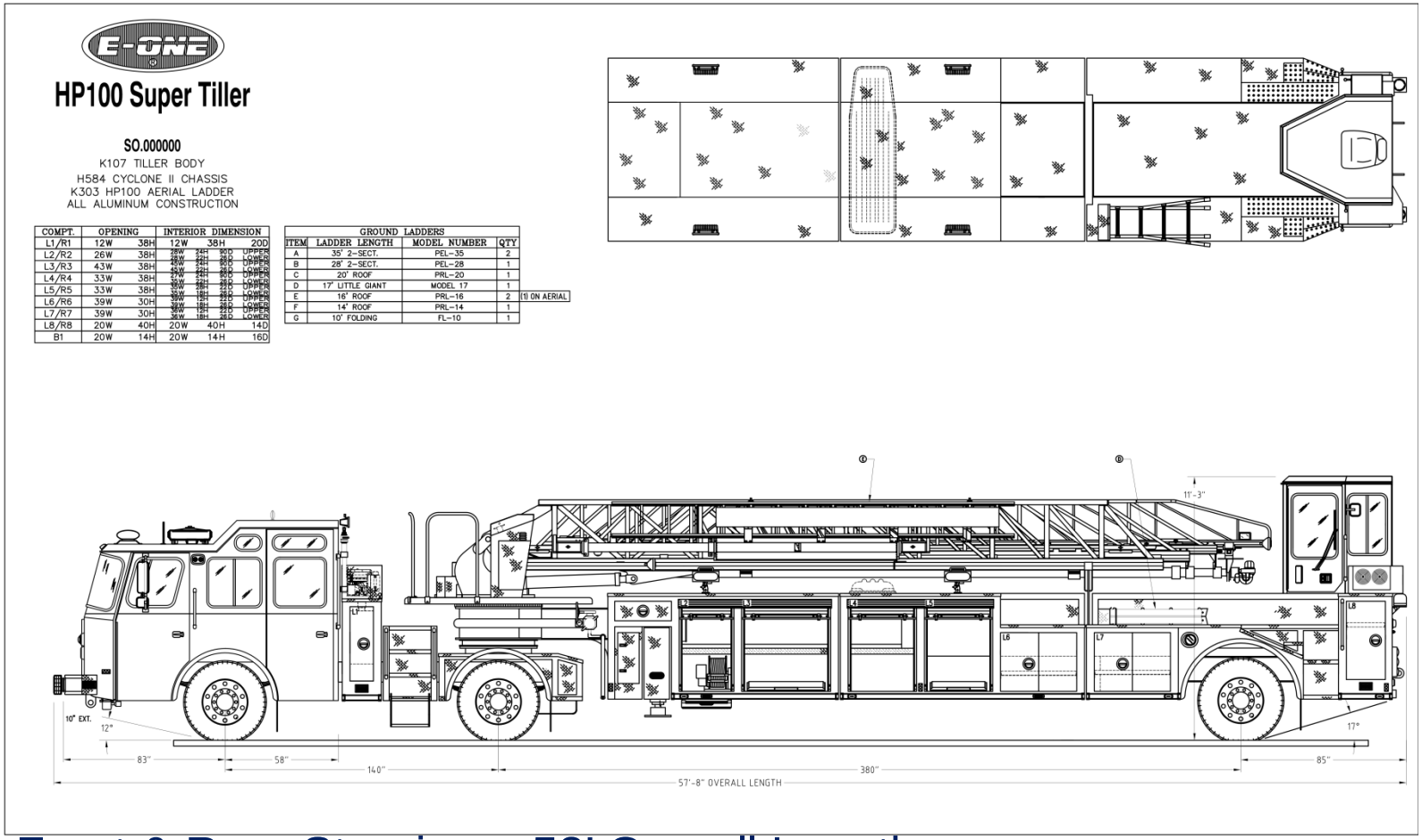
Emergency Vehicles



Front & Rear Steering – 58’ Overall Length
32’ Wheel Base

Resource: http://www.e-one.com/

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Emergency Vehicles

Other Emergency Vehicle Manufactures:
Pierce
Freightliner – Builds Busses and Fire Trucks
American LaFrance

Resource:
http://www.piercemfg.com/en/Home.aspx
http://www.freightlinertrucks.com/
http://americanlafrance.com/

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Large Trucks

- Consider Trailer Lengths & Clearances
- Stay In Lane or Take Two Lanes
- Don’t Build Obstructions Behind The Apron

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Some Reasons For Truck Accidents In Roundabouts

- Tangent High Speed Approaches (Driver Fails to Reduce Speed)
- Lack Of Deflection
- Sudden Tightening Of Radii Part Way Through The Intersection
- Clear Driver Visibility With Absence Of Approaching Vehicles
- Low Circulating Traffic, No Need To Yield, Faster Entry Speed
- Tight Curb Geometry And Small Circle Diameter
- Moving or Liquid, Partial Load Cargo
- Grading

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A Quick Comparison

Single Lane Roundabout

- Passenger Vehicle
- Fire Truck
- WB-50 Truck

Resource: NCHRP Report 672, Roundabouts: An Informational Guide
Second Edition

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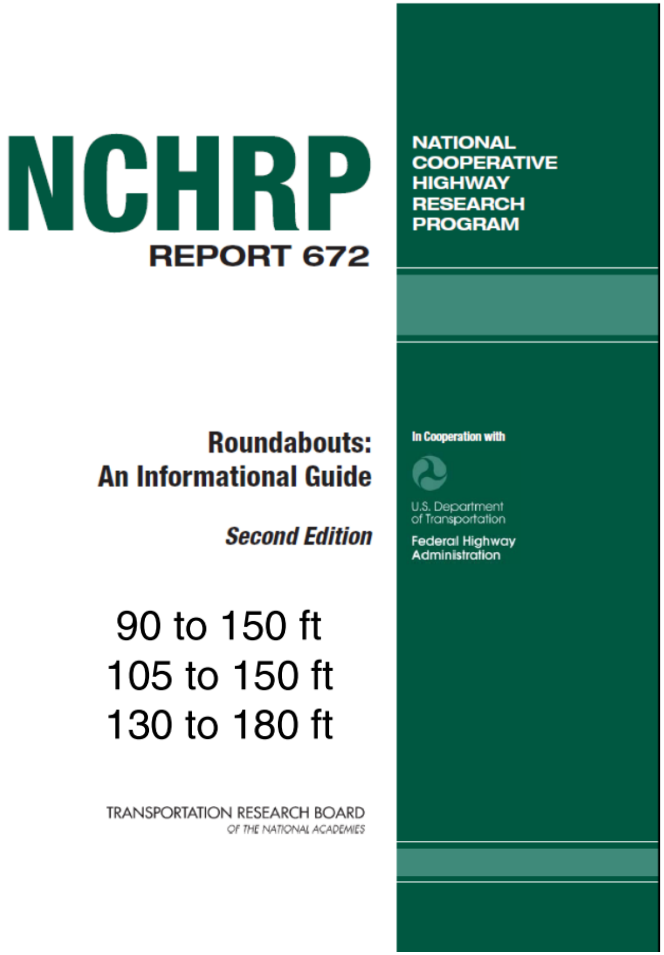
Selecting The ICD

Roundabout Configuration	Typical Design Vehicle	Common Inscribed Circle Diameter Range*	
Mini-Roundabout	SU-30 (SU-9)	45 to 90 ft	(14 to 27 m)
Single-Lane Roundabout	B-40 (B-12)	90 to 150 ft	(27 to 46 m)
	WB-50 (WB-15)	105 to 150 ft	(32 to 46 m)
	WB-67 (WB-20)	130 to 180 ft	(40 to 55 m)
Multilane Roundabout (2 lanes)	WB-50 (WB-15)	150 to 220 ft	(46 to 67 m)
	WB-67 (WB-20)	165 to 220 ft	(50 to 67 m)
Multilane Roundabout (3 lanes)	WB-50 (WB-15)	200 to 250 ft	(61 to 76 m)
	WB-67 (WB-20)	220 to 300 ft	(67 to 91 m)

* Assumes 90° angles between entries and no more than four legs. List of possible design vehicles is not all-inclusive.



Single-Lane Roundabout	B-40 (B-12)	90 to 150 ft
	WB-50 (WB-15)	105 to 150 ft
	WB-67 (WB-20)	130 to 180 ft

TYPICAL ICD RANGES
Resource: NCHRP Report 672, Roundabouts: An Informational Guide Second Edition

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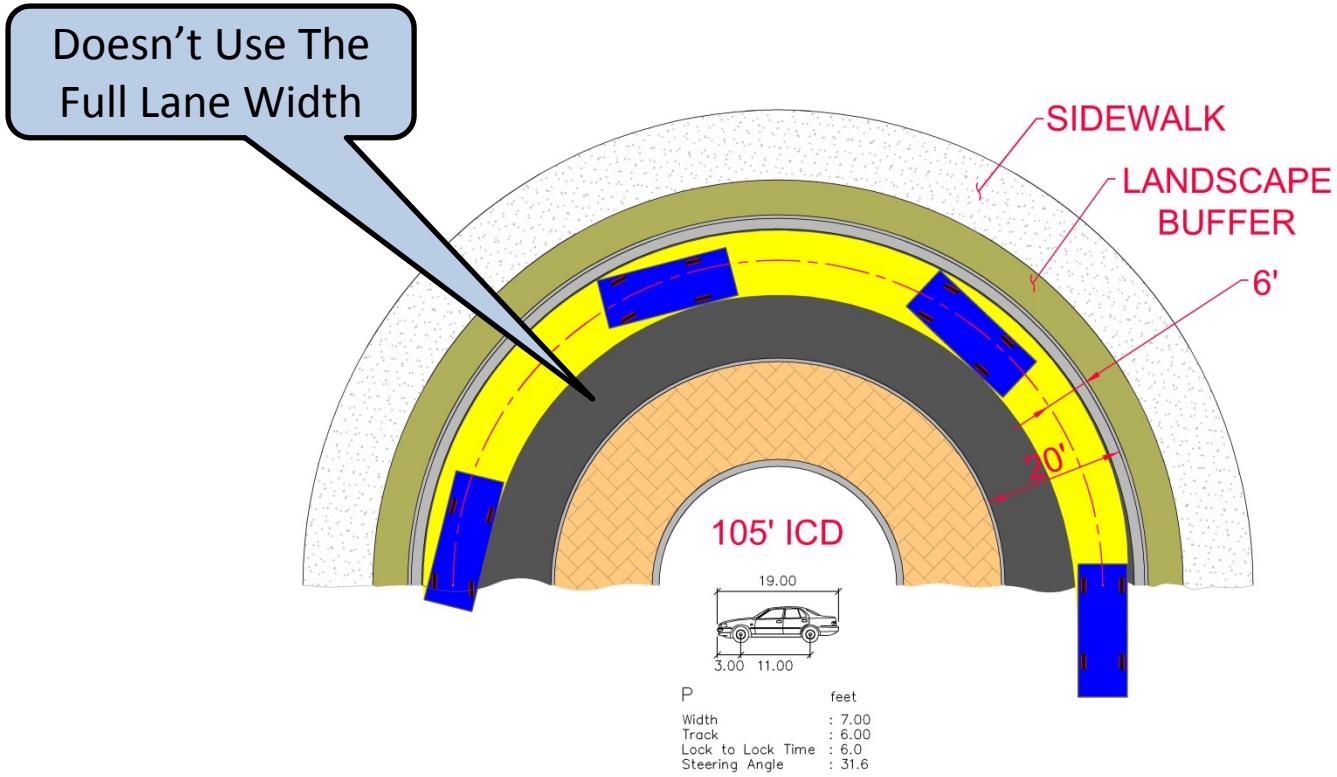

Passenger Vehicle Simulation Using AutoTURN

By Transoft Solutions

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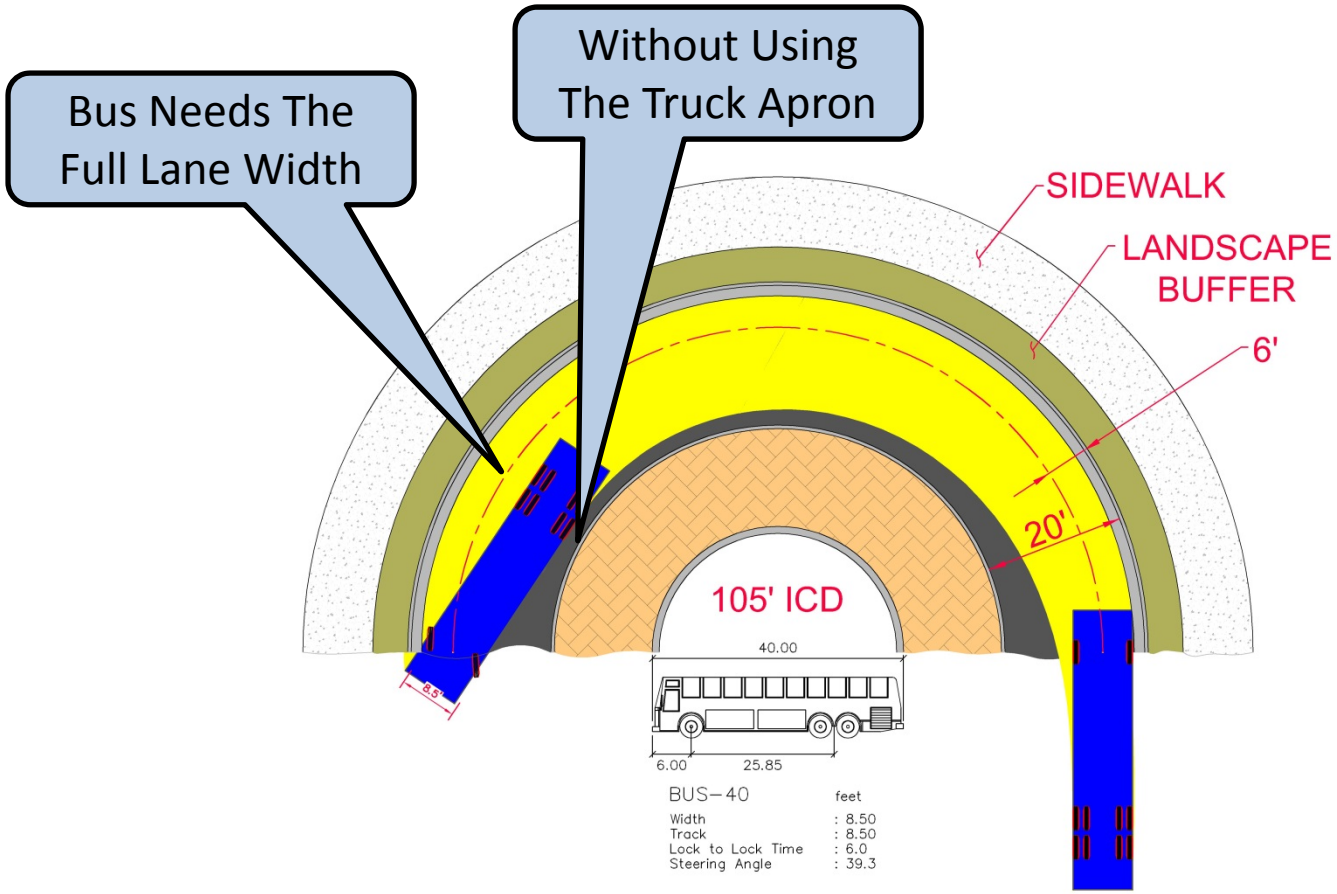

City Bus Simulation Using AutoTURN

By Transoft Solutions

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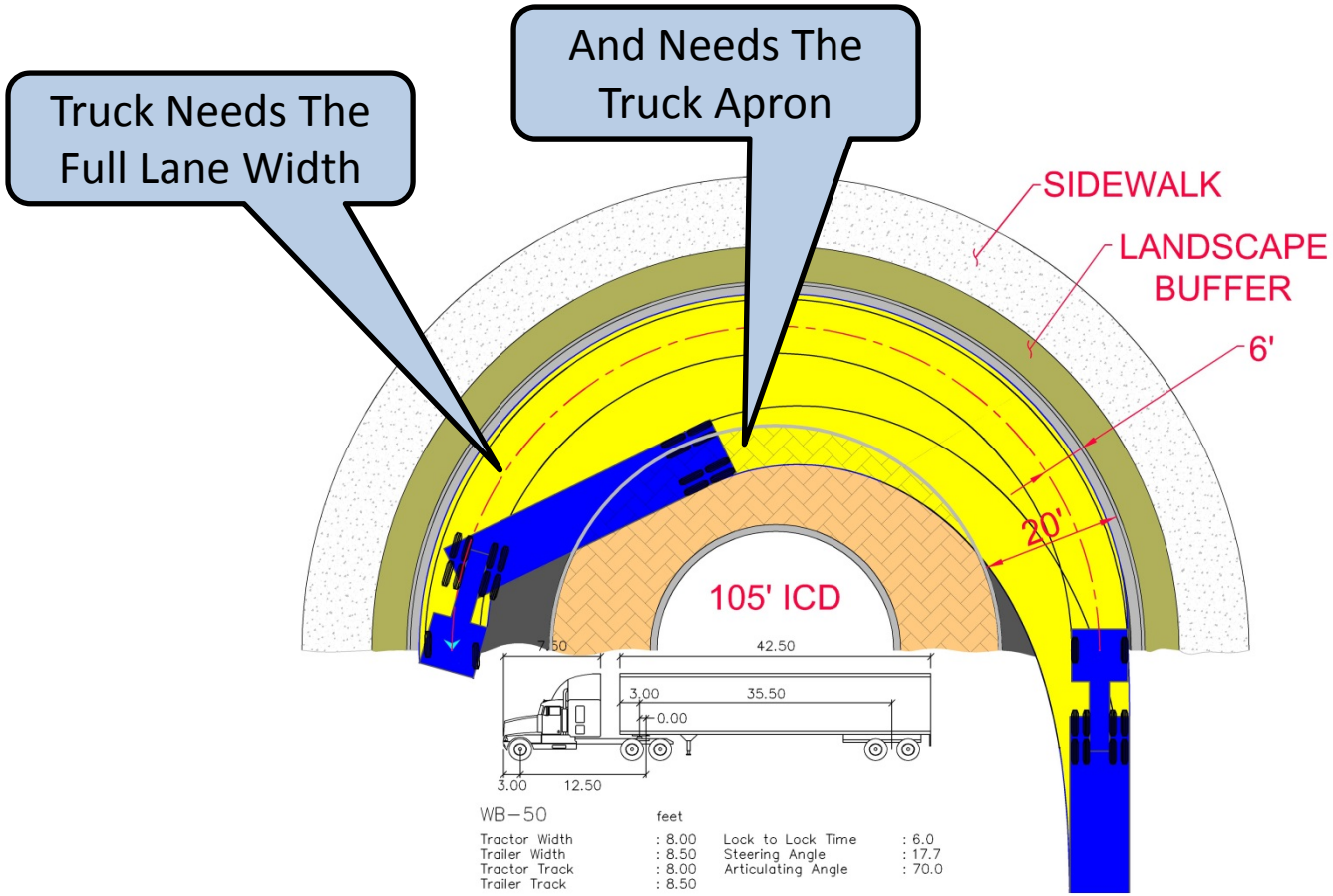

City Bus Simulation Using AutoTURN

By Transoft Solutions

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Kansas

Resource: Google Earth
100’ ICD
17’ Circulating Lane
10’ Truck Apron

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Large Truck Crash

Resource: Google

Large Truck Crash

Resource: Google

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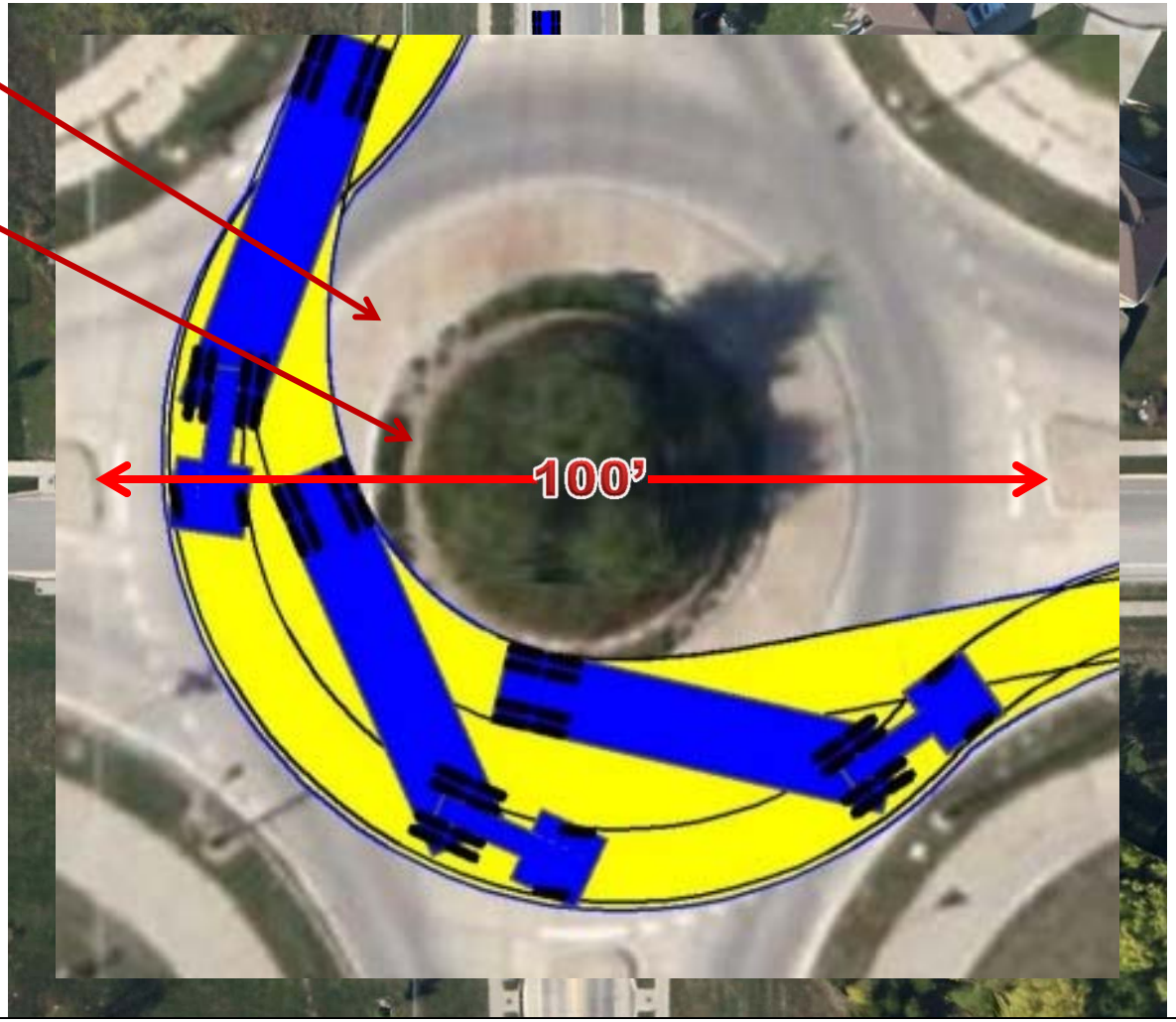
TRUCK APRON IS TOO SMALL

WALL WAS CONSTRUCTED WHERE TRUCK APRON WAS NEEDED

ICD IS TOO SMALL FOR TRUCKS



Single-Lane Roundabout		
	B-40 (B-12)	90 to 150 ft
	WB-50 (WB-15)	105 to 150 ft
	WB-67 (WB-20)	130 to 180 ft

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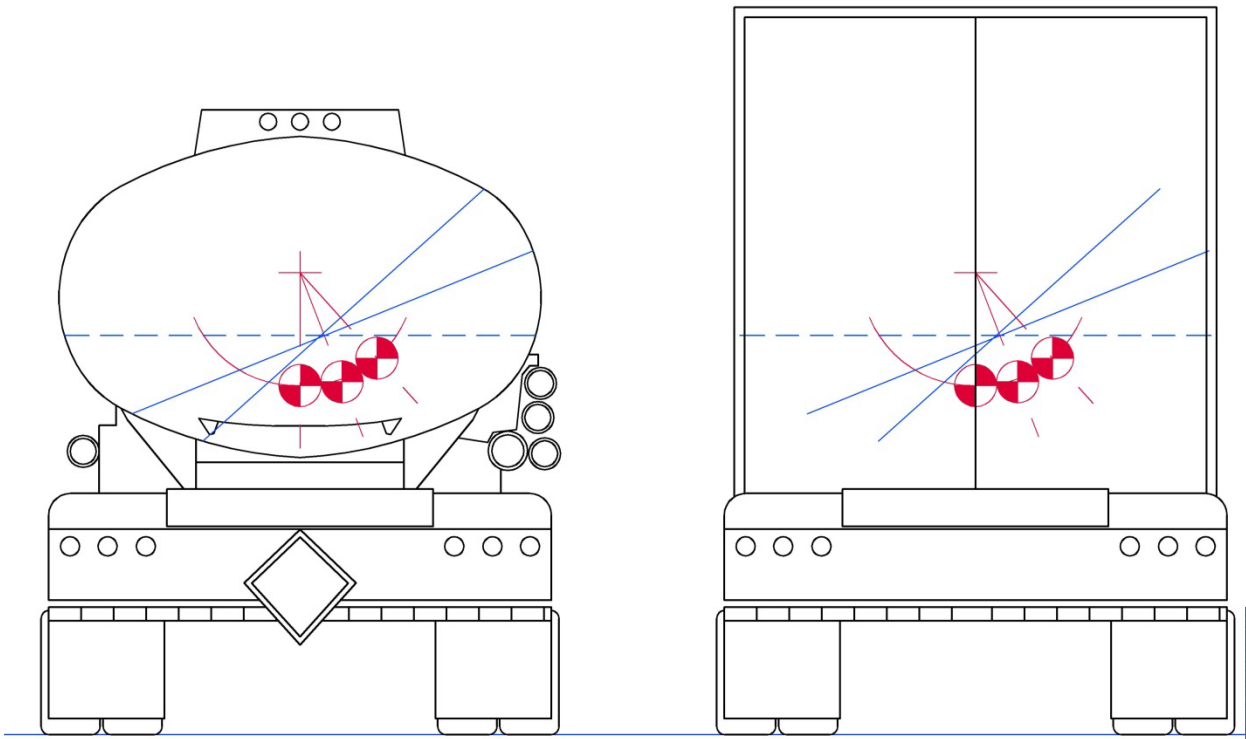
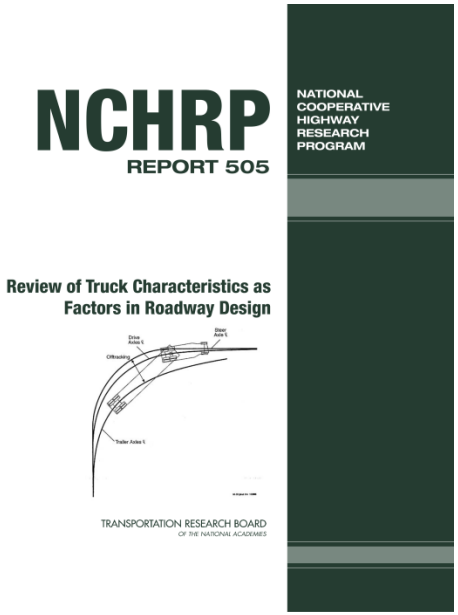
TRUCKS AND MOVING LOADS





Rollover of Heavy Commercial Vehicles

University of Michigan Transportation Research Institute

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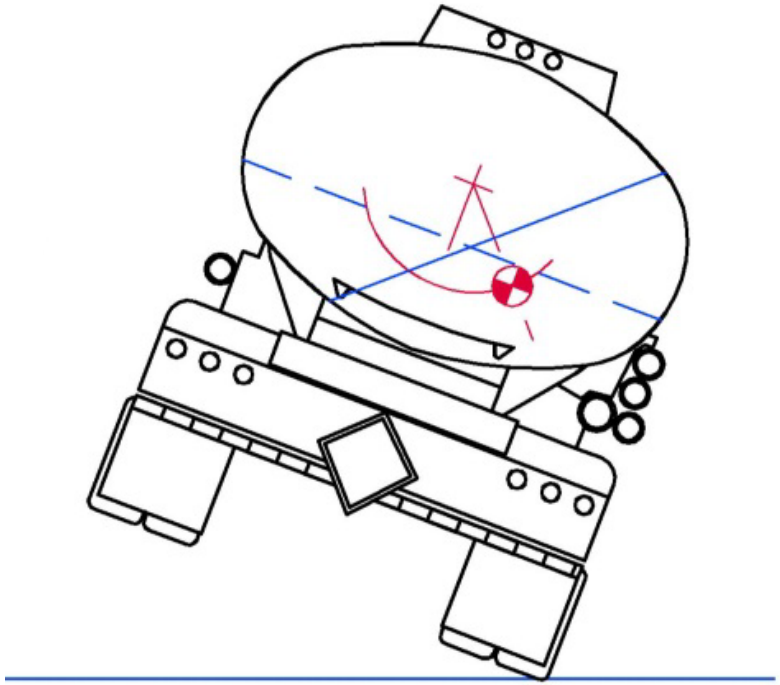
Examples Of Moving Cargo

- Bulk Liquid Trailers Partially Filled
- Refrigerated Trailers With Hanging Meat
- Livestock Trailers



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3D Model – Bulk Liquid Container Trucks

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3D Model – Bulk Liquid Container Trucks

DESIGN MUST

Reduce Speed On The Entry
Provide Deflection
Roadway & Truck Apron Grading

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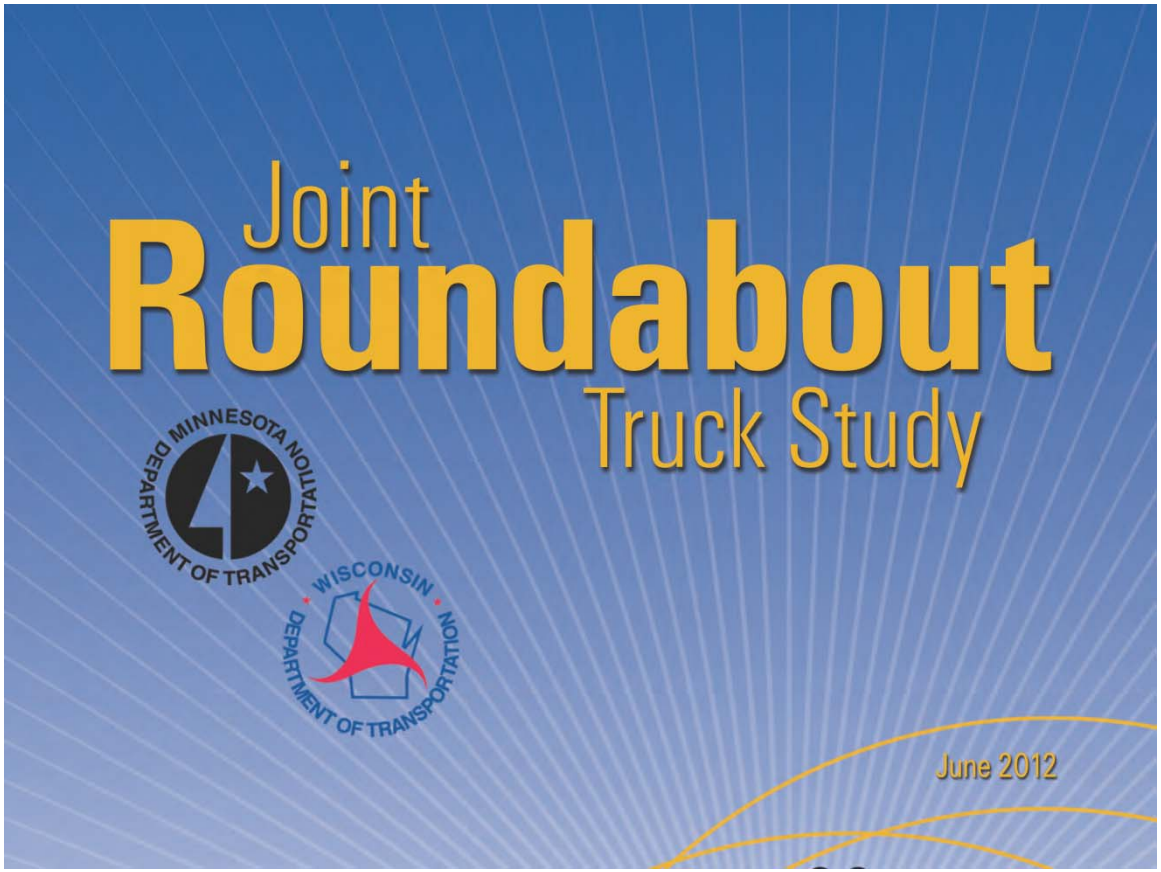

Minnesota DOT and Wisconsin DOT Sponsored

Transportation Engineering and Road Research Alliance (TERRA)

http://www.terraroadalliance.org/research/factsheets/roundabouttrucks/documents/final.pdf

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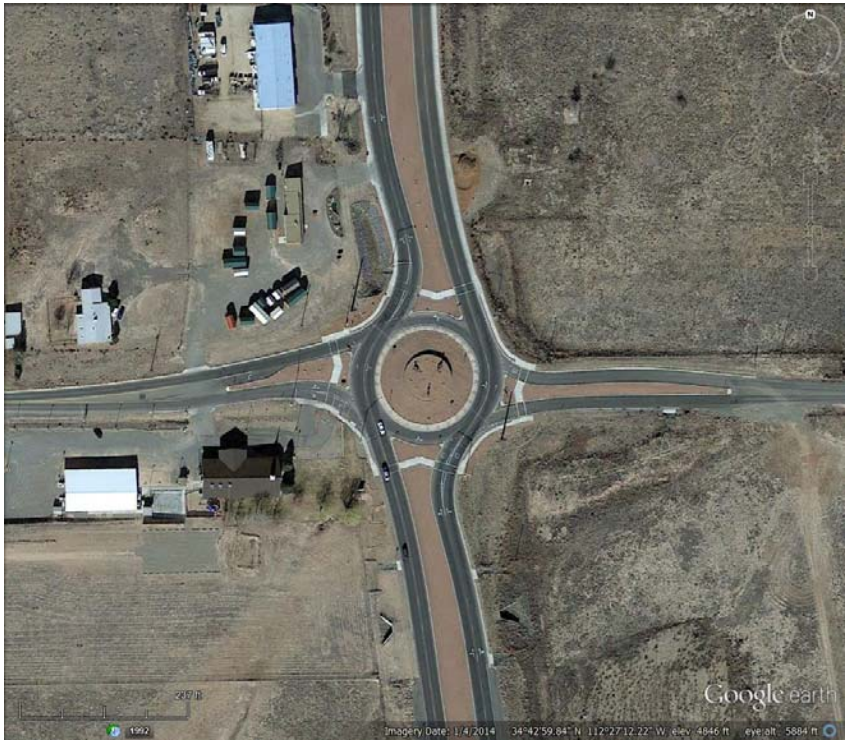
Early Design, Experienced Several Rollovers



Designed For Trucks To Stay In Lane

Roundabout Comparison

Resource: Google Earth

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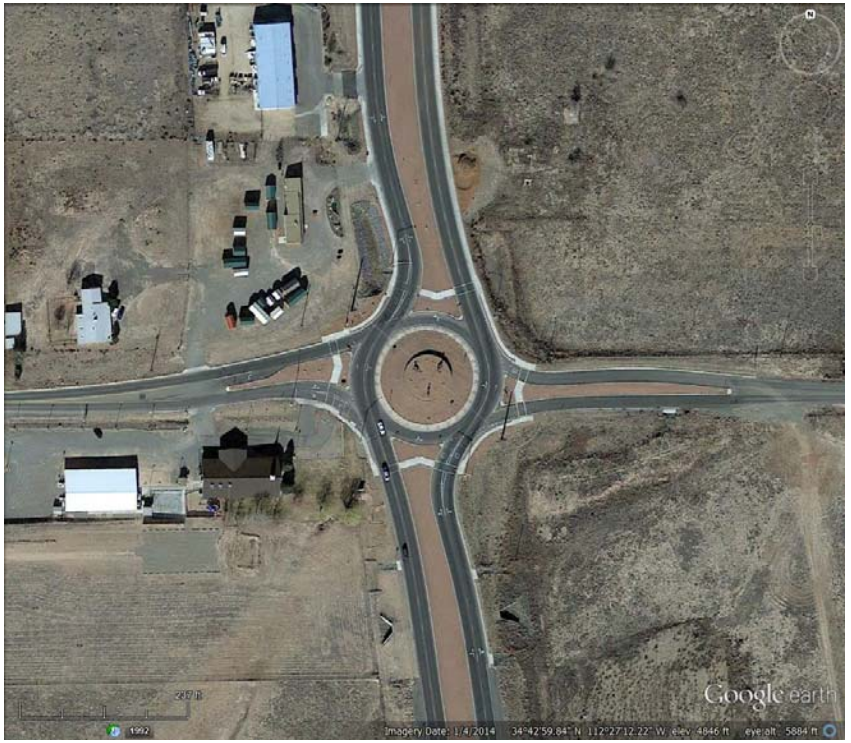
Early Design, Experienced Several Rollovers

140’ ICD

LONG TANGENT APPROACH

14’ WIDE APPROACH LANES

TWO 16’ WIDE CIRCULATING LANES



Designed For Trucks To Stay In Lane

220’ ICD

LARGE RADIUS APPROACH

WIDER APPROACH LANES WITH PAINTED GORE

14’ AND 20’ CIRCULATING LANES

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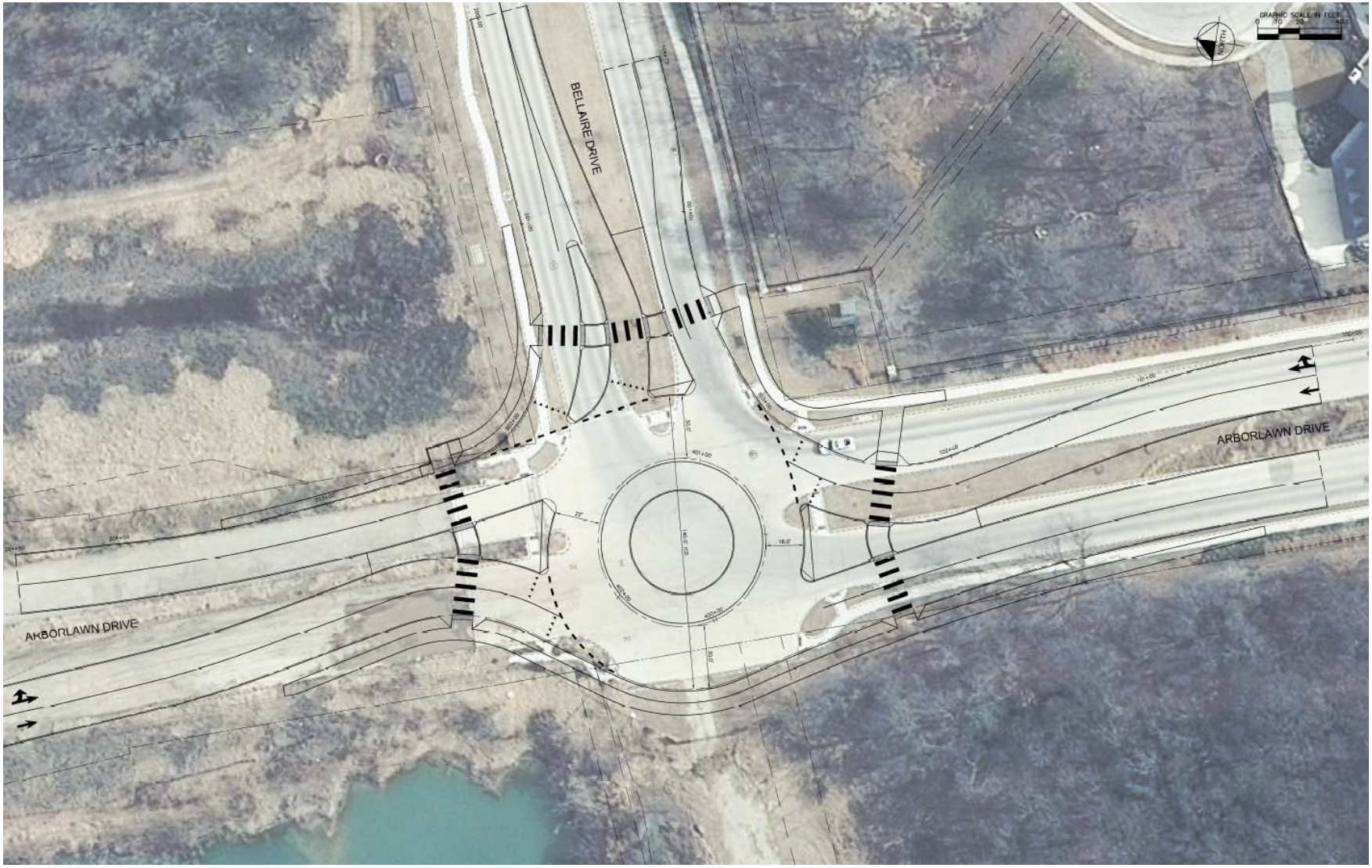

Fort Worth - Arborlawn Drive and Bellaire Drive

ICD = 140’
Circulating Lanes = 30’ and 18’
Entry Lanes = 13’ and 14’
WB-50 Needs to Use Both Lanes to Maneuver Through the Roundabout

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Fort Worth Arborlawn Drive and Bellaire Drive

ICD = 180’
Circulating Lanes = 30’
Entry Lanes = 13’ and 14’
WB-50 Can Stay In-Lane

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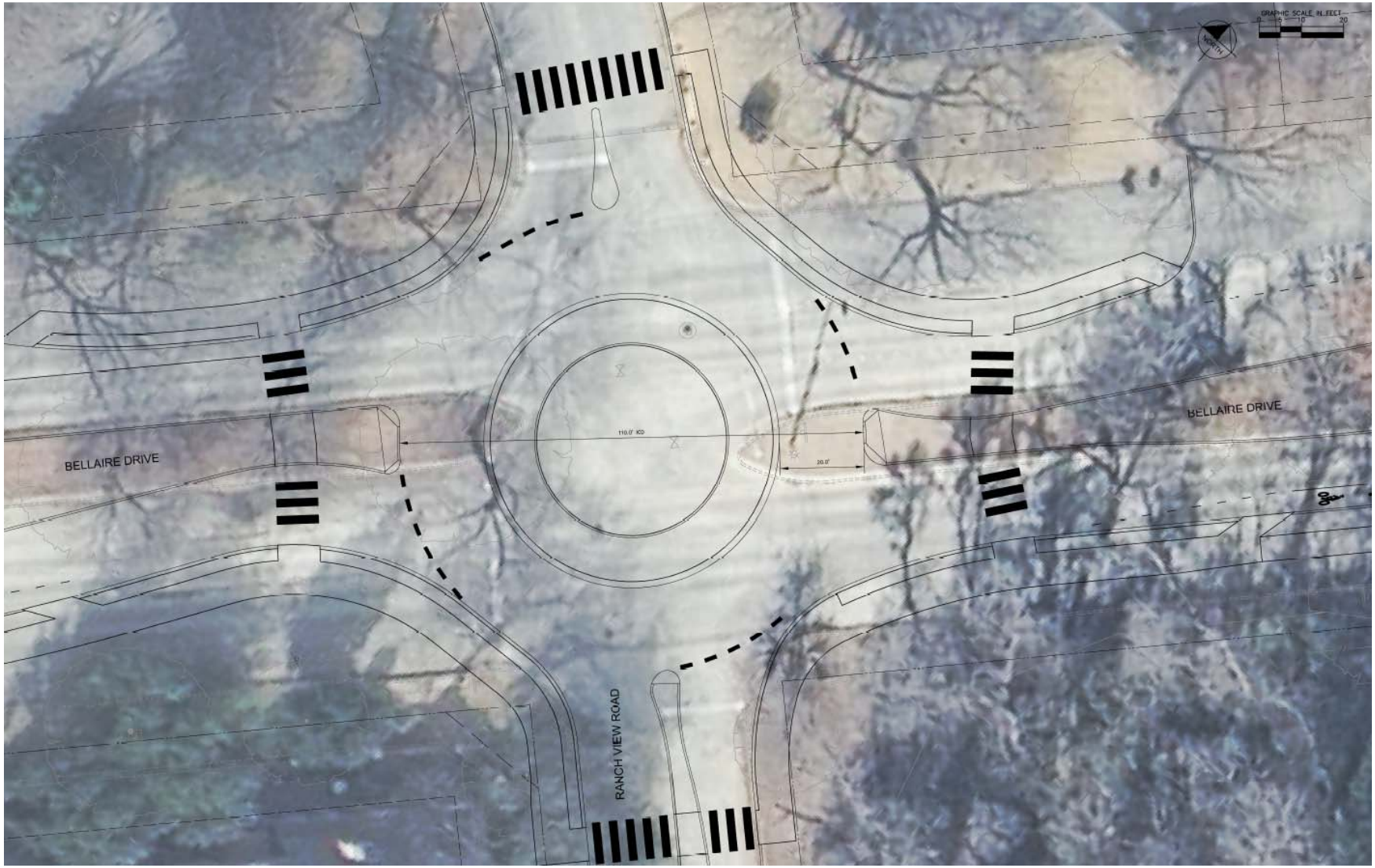

Fort Worth - Bellaire Drive and Ranch View Road

ICD = 110’
Circulating Lanes = 20’
Fire Truck Can Stay In-Lane

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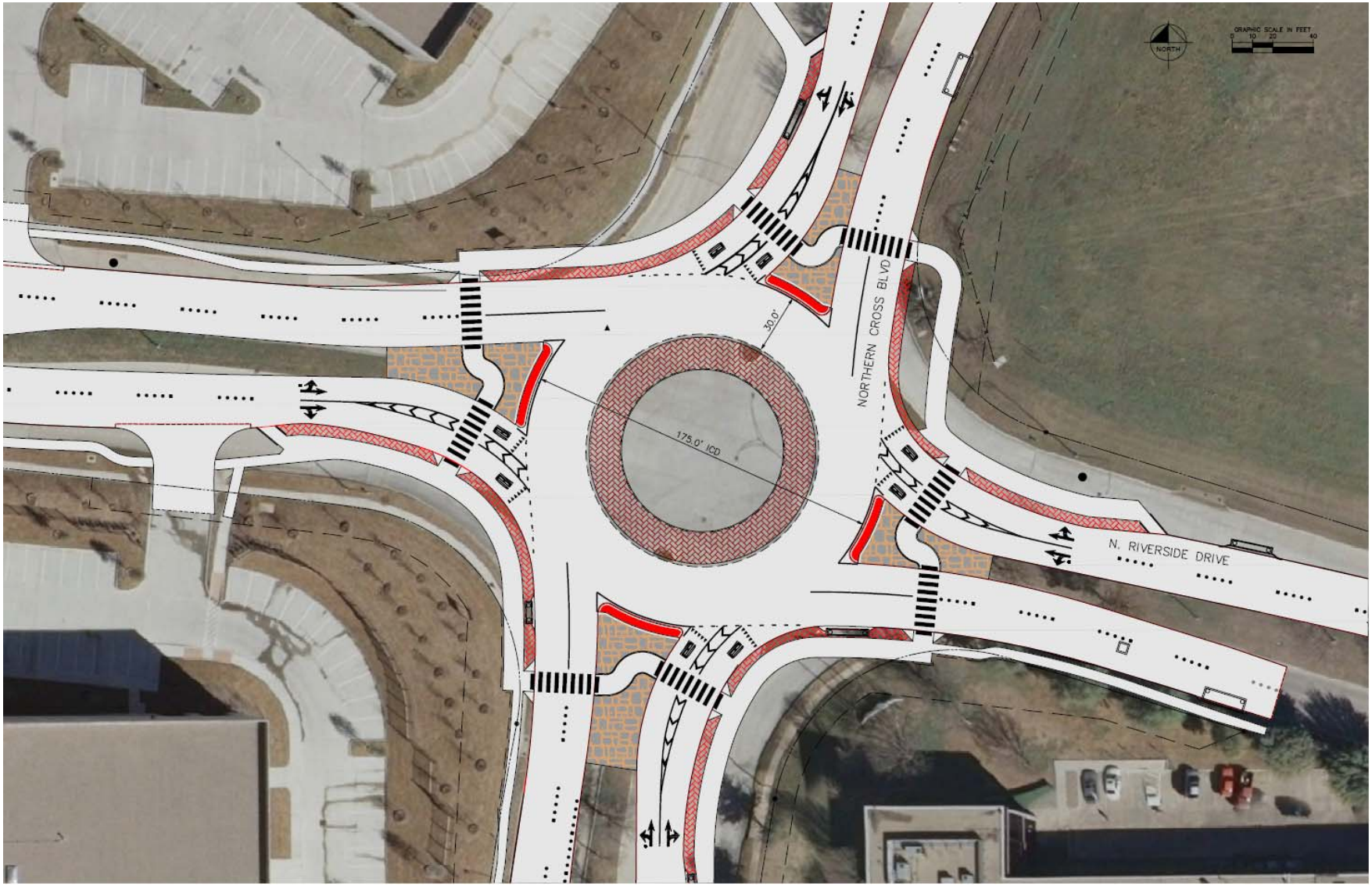

Fort Worth - N. Riverside Drive and Northern Cross BLVD

ICD = 175’
Circulating Lanes = 30’
Entry Lanes - 12’ Lanes with Truck Gore
WB-50 Can Stay In-Lane

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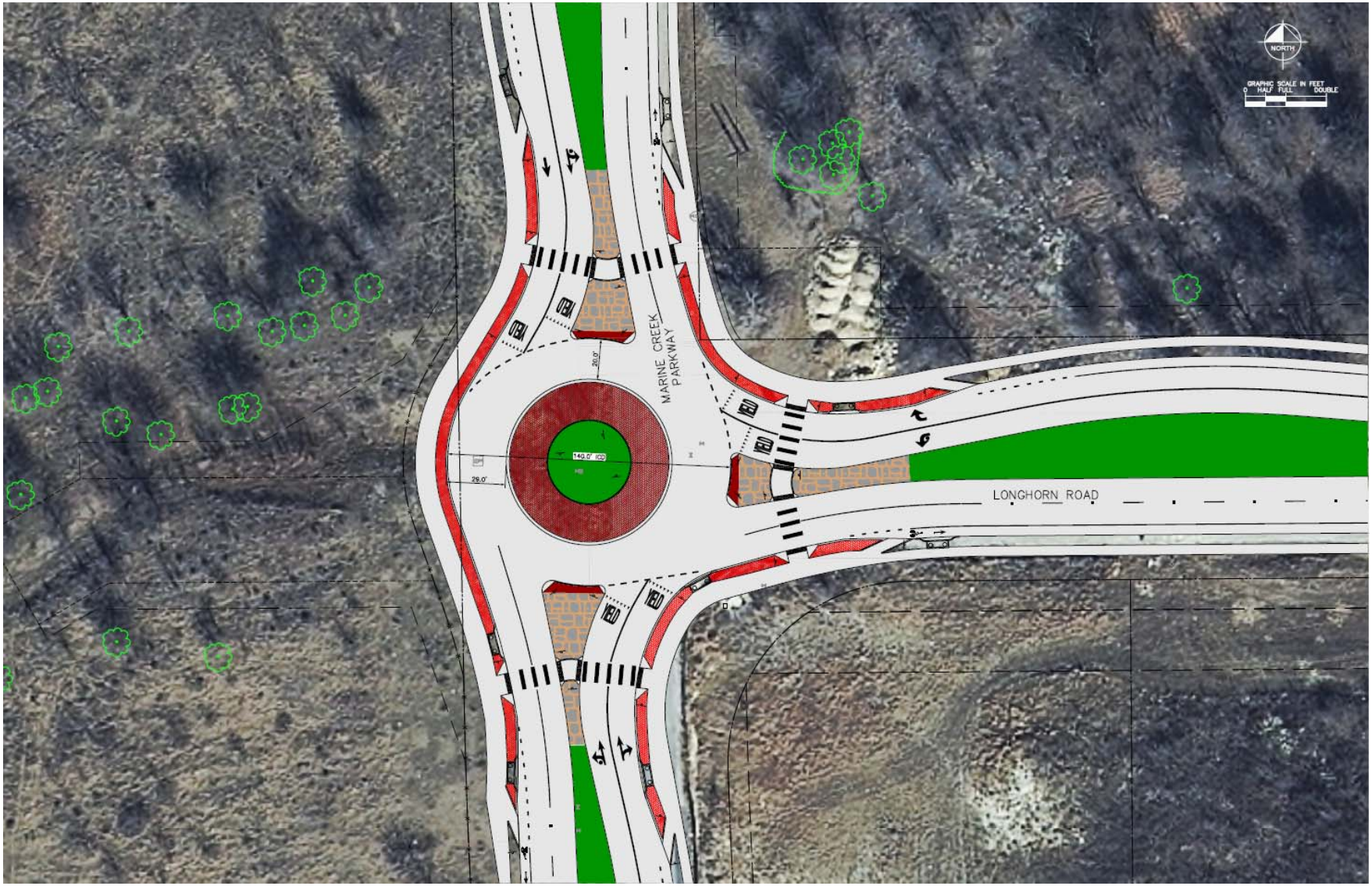

Fort Worth N. Riverside Drive and Northern Cross BLVD

ICD = 140’

Circulating Lanes = 29’ and 20’

WB-50 and Horse Trailers can Stay In-Lane

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3D Model – Oversized & Overweight Trucks

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3D Model – Oversized & Overweight Trucks

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Questions

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